**Remarks**

Claims 1, 40-45, 57-59, 62, 64, 66 and 72 have been amended, new claims 74-91 have been added and claims 9, 10, 51, 52, 55 and 67-70 have been canceled. Review and reconsideration in view of these amendments and the remarks below are requested.

Claims 1-32 and 36-44 are rejected under 35 U.S.C. § 112, first paragraph for failing to comply with the enablement requirement. More particularly the Office action indicates that the specification does not describe locating an infrared sensitive component on the diaphragm such that one skilled in the art is not able to make the invention. The Office action also indicates that the specification does not describe the infrared sensitive component above the diaphragm such that one skilled in the art is not able to make the invention. However, this rejection is respectfully traversed for the reasons set forth below.

The application, on several occasions, describes locating the infrared sensitive component on and above the diaphragm, and also goes to great lengths to describe how this is accomplished. For example, the specification describes the infrared detecting component as being located on the diaphragm at page 2, line 6, and at page 5, line 3 - page 6, line 5 (and more particularly at page 5, lines 17-20). Figures 1, 1b, 1c, 2 and 7-16 also disclose an infrared sensitive component located on the diaphragm.

In addition, the specification goes into significant detail explaining how to form the infrared sensitive component on the diaphragm. Methods for forming the sensor are shown in Figs. 4-16 and described at page 7, line 25 - page 19, line 8. This section of the specification and drawings also specifically shows how to locate the infrared sensitive component on the diaphragm. A particular description of the infrared sensitive component is included, for example, at page 5, lines 3-10.

It is also submitted, for the reasons discussed above, that the specification describes an infrared sensitive component above the diaphragm. More particularly, when an infrared sensitive component is located "on" a diaphragm it can also be considered to be located above the diaphragm.

As noted at MPEP §2164.01, the test of enablement is whether the disclosure contains sufficient information regarding the subject matter of the claims as to enable one skilled in the art to make and use the claimed invention. It is submitted that the specification fully discloses

and describes the location of an infrared sensitive component on and above the diaphragm and describes how to make and use an infrared sensitive component on and above the diaphragm. Under MPEP §2164.04, the Office bears the initial burden to establish a reasonable basis to question the enablement of the claimed invention. Accordingly, should this rejection be continued, further explanation is provided so that the Applicant can more fully respond.

Claims 64, 65, 72 and 73 are rejected under 35 U.S.C. § 112, first paragraph as being indefinite. Accordingly claims 64 and 72 have been amended to address the errors noted in the Office action. Claim 62 has also been amended to correct an error in its dependency.

Claims 1-8, 10-12, 14, 15, 17, 27, 32, 36 and 39-43 are rejected as being anticipated by U.S. Pat. No. 4,959,546 to Bly. Accordingly, claim 1 has been amended to include the subject matter of claim 9, and claim 9 has been canceled. Claim 1 thus now specifies that the diaphragm includes benzocyclobutene.

Claim 9 is rejected as defining obvious subject matter over the Bly reference in view of U.S. Pat. No. 6,380,605 to Verhaegen. Accordingly, to the extent the rejection of claim 9 would be carried over to amended claim 1, such a rejection is respectfully traversed for the reasons outlined below.

As an initial matter, it is noted that the thermo-optical infrared system of the Bly reference includes a diaphragm 19a. As can be seen in Fig. 1 of Bly, the diaphragm 19a provides mechanical support to the layers 19b, 19c, 19d, 19e located thereon.

The Office action proposes using the insulating layer 55 (Fig. 5) of the Verhaegen reference (which is disclosed, in one case, to be made of benzocyclobutene) as the diaphragm 19a of the Bly reference. However, the insulating layer 55 of the Verhaegen patent is an electrically insulating layer which electrically insulates the first and second conductors 54, 56 of the thermocouple of Verhaegen. For example, as noted at column 11, lines 16-21 of the Verhaegen reference, the insulating layer 55 is used as an dielectric layer to isolate the polysilicon fingers (54, 56) from each other.

In contrast, the "diaphragm" of the Verhaegen reference is disclosed to be layer 57 which provides mechanical support to the thermocouple (see column 11, lines 34-37), and adds additional functionality. Thus, it is submitted that the insulating layer 55 of Verhaegen is more

properly considered to be part of the thermocouple, and layer 57 is properly considered a diaphragm, which is in fact consistent with the terminology of the Verhaegen reference.

Accordingly, it is submitted that if one of ordinary skill in the art were to be motivated to utilize a membrane material from the Verhaegen reference in the system of the Bly reference, such a person would utilize the materials listed for the membrane 57 of Verhaegen, given the common terminology and functionality of the layers 19a (of Bly) and 57 (of Verhaegen). The Verhaegen reference does not appear to disclose that the membrane 57 can be made of benzocyclobutene. Thus, it is submitted that the subject matter of claim 1 would not result, even when the Bly and Verhaegen references were to be combined.

In addition, it is submitted that the insulating layer 55 of the Verhaegen reference cannot be considered to constitute a "diaphragm" on the basis that the insulating layer 55 appears to be formed in a plurality of "strips" across the sensor. For example, Fig. 1 of the Verhaegen reference illustrates a thermopile 2 having a plurality of strips of material (in solid black shading) extending laterally across a cavity. With reference to Fig. 2 of the Verhaegen reference, the thermocouple includes conductive materials 13, 14 with an insulating layer 15 therebetween. This structure can be seen in a similar (but inverted) format in the system of Fig. 5 (the figure relied upon in the rejection; see reference number 56).

Accordingly, although a top or perspective view of the device of Fig. 5 is not shown, it appears that the system would include a plurality of thermocouples extending in the form of strips in a left-to-right direction in the direction similar to Fig. 1. Each thermocouple includes two conductive materials 54, 56 with an insulator (i.e., layer 55) therebetween. In this case, the insulating layer 55 appears to extend only in strips across a "cavity" of that device, and therefore cannot be considered to correspond to a "membrane." Thus, it is submitted that for this additional reason claim 1 defines over the cited references.

It is also submitted that the Office action does not provide sufficient motivation for the proposed combination. More particularly, with respect to claim 9, as support for the proposed combination, the Office action cites to the fact that the layer 55 of Verhaegen (allegedly) extends across a recess and supports an infrared sensitive component, and cites to its "suitability and compatibility with aluminum." However, it is noted that the thermo-optical system of the Bly reference requires a membrane 19a with specific qualities in order to allow

the thermo-optical system to operate as desired. It is submitted that materials from a thermoelectrical detector (such as in the Verhaegen reference) cannot always be interchanged with components in a thermo-optical infrared system (such as in the Bly system). The Bly reference does not appear to specify a need for any alternate diaphragm materials.

As is well known, "[T]here must be showing of a suggestion or motivation to modify the teaching of a reference . . . . whether the Board relies upon an express or implicit showing, it must provide particular findings thereto [citation omitted]. Broad conclusory statements standing alone are not 'evidence'." *In re Kotzab*, 55 U.S.P.Q. (BNA) 2d, 1313, 1317 (Fed. Cir. 2000). In this case the Office action merely cites to a layer of benzocyclobutene material in a wholly different type of sensor (a thermoelectrical sensor; as compared to the optical sensor of Bly), when the layer serves a different function (operating as a dielectric as opposed to an isolated supporting membrane), and apparently has a different structure, and concludes the proposed modification would be obvious. Accordingly, it is submitted that claim 1, as amended, is patentable over the cited references. Independent claim 40 has been amended in a manner analogous to claim 1, and is therefore submitted to be allowable for the same reasons.

With respect to claims 18, 19, 25 and 26, the Office action essentially proposes utilizing the infrared sensitive component of the Verhaegen reference in the system of the Bly reference. However, this rejection is respectfully traversed on the basis that one of ordinary skill in the art would not undertake such a modification of the Bly reference given the extremely disparate nature of the sensors of the Verhaegen and Bly references. More particularly, the Bly reference is directed to a thermo-optical far infrared system wherein changes in temperature are measured optically. For example, with respect to Fig. 1 of the Bly reference, a beam 11 is emitted from a laser 10 and focused by lenses 12, 13 to a beam splitter 15. A split beam 16 is focused by lens 18 upon the detector 19. The reflected beam passes back through lens 18 toward the beam splitter 15, and part of this reflected beam passes on as beam 25 through lens 26, which focuses the beam out to a visible signal detector. The output of the visible signal detector is indicative of the infrared radiation falling onto the detector 19. A laser control detector receives a beam 22 to accommodate variations of brightness of the laser. Thus, the thermal-optical system of the Bly reference does not require any direct physical contact with

the detector 19 and instead allows remote infrared detecting through the use of an elaborate optics network.

In contrast, the system of the Verhaegen reference is a thermoelectrical infrared detector which operates on completely different principles. That system utilizes thermopile/thermocouple technology which causes a voltage to be generated, wherein the generated voltage is related to temperature differential. A direct electrical connection is made to the thermopile to detect the generated voltage, and no optics are necessary.

Accordingly, if the Bly reference were to be modified by the Verhaegen reference as proposed (i.e., by using the thermopile of the Verhaegen reference in the system of the Bly reference), this modification would entail removing the laser 10, laser control 24, the optics 12, 13, 18, 22, 26, the beam splitter 15, as well as the laser control detector and visible signal detector of Bly (or at least rendering those components useless). In addition, the detector 19, including layers 19b, 19c, 19d and 19e, would be removed (or rendered useless). The thermopile of the Verhaegen reference would then presumably be used in place of the layers 19b, 19c, 19d and 19e. After this wholesale restructuring, the only components of the original Bly reference that would remain would appear to be the diaphragm 19a (which would itself apparently be argued to be modified to use different materials), cone 20 and ring 21. Indeed, although the Office action cites, as a motivation for the proposed modification, the "reduced optical complexity," the Office action in fact proposes a complete removal of the optical components of the optical sensor and a switch to a thermoelectrical system.

As noted in MPEP §2143.02, if a proposed combination of the prior art would change the principle of operation of the prior art being modified, the teachings of the references are not sufficient to render the claims obvious. In this case, the Office action proposes radically changing the principles of operation of the system of the Bly reference from a thermo-optical infrared system to a thermoelectrical system which operates in a significantly different manner. All of the sensors and controls, and indeed the very principles of operation, of the Bly reference would be drastically altered.

In fact, the Bly reference itself recognizes the distinction between varying types of sensors. For example, at column 1, lines 10-34, the Bly reference notes:

> The present invention is in the field of uncooled infrared detectors. Such detectors are of two general types: thermal and quantum. In a thermal

> detector, absorbed protons cause a rise in detector temperature and some temperature-dependent property of the detector is monitored to determine its change with temperature. Typical of such detectors are . . . thermocouples . . . . A quantum detector, on the other hand, does not require a temperature rise (although one may occur) in order to have a change in some detector characteristic. Typical quantum detectors are photoelectric detectors operating on such effects as photovoltaic, photoconductive, etc. . . . All of the above detectors suffer from one or more disadvantages, such as slow response time, low signal-to-noise ratio, etc. The instant invention overcomes the various other detectors discussed above, has a high D*, fast response time, and high signal-to-noise ratio.

Finally, it is submitted that due to the differing nature of the sensors of the Verhaegen and Bly references, if the sensor of the Verhaegen reference were to be used in the sensor of the Bly reference, the resultant structure would be ineffective as an infrared sensor. More particularly, the Verhaegen reference appears to be a thermal sensing device which sensing differing temperatures by *heat conduction*. For example, with reference to Fig. 5(f) of Verhaegen two different materials are placed into the two cavities (see column 10, line 66 – column 11 line 5). One of the materials may constitute a reference substance and the other may constitute a test substance (see column 2, lines 58-63). Relative changes in heat content or enthalpy (due to chemical or physical reactions) of the materials in the cavities can then be measured (see column 3, lines 13-16). When the two substances are placed in the upper cavities of Fig. 5(f) they appear to transmit heat to the thermocouple conductively, and not by infrared radiation.

Thus, the sensor of the Verhaegen reference is designed to sense changes in heat content by conduction, and cannot be effectively used as an infrared sensor. The thermocouple 54, 55, 56 of Verhaegen includes an insulating layer 53, 57 on either side thereof, and these insulating layers 53, 57 are not disclosed to be transparent to infrared radiation. Thus the layers 53, 57 would block any infrared radiation from reaching the thermocouple 54, 55, 56. In addition the thermocouple would not effectively function as an infrared detector due to the thickness of the various layers 53, 54, 55, 56 and 57. The thickness of the various multilayers would prevent the detector from effectively detecting infrared radiation, although the layers are not so thick so as to prevent effective heat conduction.

Accordingly, it is submitted that due to the radical differences in design and inherent

nature of the Bly and Verhaegen references (i.e. optical, infrared sensor vs. a thermoelectric, conductive-heat sensor) the references cannot be combined in the manner proposed in the Office action. The two types of sensors operate on completely different principles, and it is submitted that the Bly and Verhaegen references cannot be combined in the manner proposed in the Office action. Similar arguments apply with respect to the proposed combination of the Bly and Endo references.

Independent claim 41 has been amended to specify that the infrared sensitive component or piezoelectric or piezoresistive element is configured to generate an electrical signal, indicative of infrared radiation or ultrasonic waves, that can be sensed by instrumentation. This added limitation of claim 41 is somewhat analogous to claim 18 which is rejected as defining obvious subject matter over the Bly and Verhaegen references.

In contrast, the components 19b, 19c, 19d and 19e of the Bly reference are not configured to generate an electrical signal, indicative of infrared radiation or ultrasonic waves, that can be sensed by instrumentation. Instead the output of those components are sensed by laser (optical) systems. In addition, as outlined above, it is submitted that one of ordinary skill in the art would not be motivated to utilize the conductive-style thermopile of the Verhaegen reference in the thermo-optical infrared system of the Bly reference due to the dramatically different nature of those devices.

Independent claim 42 has been amended to specify that the diaphragm is made of benzocyclobutene (thereby distinguishing over Bly) and has a pair of opposed major sides. Claim 42 has also been amended to specify that the infrared sensitive component or piezoelectric or piezoresistive element is a thermocouple entirely located on only a single side of the diaphragm. As noted above it is believed that the insulating layer 55 of the Verhaegen reference is more properly considered to be part of the thermocouple. Thus the Verhaegen reference includes thermocouple made of elements 54, 56, and the insulating layer 55, and thus is not located on only a single side of the "diaphragm" 55. In addition as noted above it is submitted that the Bly and Verhaegen references cannot be combined in the manner proposed in the Office action. Further, as outlined above, it appears that the insulating layer 55 of Verhaegen extends in "strips" and thus cannot be considered a diaphragm.

Independent claim 43 has been amended to specify that the infrared sensitive

component or piezoelectric or piezoresistive element is configured to generate an electrical signal, indicative of infrared radiation or ultrasonic waves, that can be sensed by instrumentation. Claim 43 also specifies that the infrared sensitive component or piezoelectric or piezoresistive element is located on, above or supported by the diaphragm. In contrast, the components 19b, 19c, 19d and 19e of the Bly reference are not configured to generate an electrical signal, indicative of infrared radiation or ultrasonic waves, that can be sensed by instrumentation. Instead the output of those components are sensed by laser (optical) systems. In addition, as noted above it is submitted that it is improper to suggest modifying the Bly reference to utilize the sensor of the Verhaegen reference.

It is noted that independent claim 44 is indicated, in the Office action summary, to be rejected, and is more particularly rejected in paragraph 3 of the Office action under 35 U.S.C. §112, first paragraph. However, no rejection of claim 44 over any cited art could be found. Accordingly, it appears that claim 44 may define allowable subject matter, and confirmation thereof is respectfully requested. In addition, claim 44 has been amended to specify that the infrared sensitive component or piezoelectric or piezoresistive element is directly electrically connected to a monitoring device to further distinguish that claim over the cited art.

Independent claim 45 is rejected as being anticipated by Verhaegen. Accordingly, claim 45 has been amended to specify that the diaphragm is benzocyclobutene and that the infrared sensitive component or piezoelectric or piezoresistive element is an infrared sensitive thermocouple component. Claim 45 has also been amended to specify that the diaphragm has a pair of opposed major sides, and wherein the thermocouple is located on only a single side thereof. In contrast, in the Verhaegen reference, the thermocouple includes elements 54, 56, and arguably, the insulating layer 55, and thus is not located on only a single side of the "diaphragm" 55.

New claim 74 depends from claim 40 and includes some limitations analogous to those added to claim 42. New claim 75 depends from claim 40 and includes limitations analogous to those added to claim 41. New claim 76 depends from claim 75 and specifies that the infrared sensitive component or piezoelectric or piezoresistive element is entirely and directly supported by the diaphragm.

New claim 77 depends from claim 40 and specifies that the diaphragm extends across and generally entirely covers the recess. In contrast, as noted above the insulating material of the Verhaegen reference appears to take the form of strips.

New claim 78 depends from claim 40 and specifies that the infrared sensitive component or piezoelectric or piezoresistive element is generally entirely covered by the diaphragm. For example as can be seen in Fig. 1b of this application the sensing element is entirely covered by (i.e. encased in) the diaphragm material. In contrast, neither the Bly nor Verhaegen reference appear to disclose this claim limitation.

New claim 79 depends from claim 40 and specifies that the diaphragm is continuous and lacks any holes formed therethrough. In contrast, the insulating layer 55 of the Verhaegen reference is indicated to include holes formed therethrough (see column 11, lines 21-23). The use of a continuous diaphragm helps to ensure isolation and improved functionality of the sensor.

New claim 80 depends from claim 40 and specifies at least one surface of the infrared sensitive component or piezoelectric or piezoresistive element is generally exposed or is covered only by a material that is generally transparent to infrared radiation such that infrared radiation emitted by an external source in a direction generally perpendicular to the diaphragm can be detected by the infrared sensitive component or piezoelectric or piezoresistive element. For example, as noted at page 7, lines 22-24 of this application, the diaphragm may be generally transparent to infrared radiation to allow the detector to detect infrared radiation from either side of the diaphragm. As noted at page 19, lines 16-17 of this application, if a window 86 is utilized, the window should be transparent to infrared radiation. Since the infrared sensitive component is an infrared detector, it is of course only logical that that infrared radiation should be able to be received at and detected by the detecting element.

In contrast, as outlined above, the detector of the Verhaegen reference is a thermal sensor which senses heat transferred by conduction. The various layers 53, 57 on either side of the thermocouple are not indicated to be transparent to infrared radiation. Thus new claim 80 further distinguishes over the Verhaegen reference.

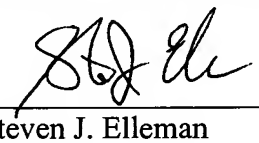
New claims 81-85 depend from claim 42 and include limitations similar to those discussed above. New claims 86 and 91 depend from claims 42 and 45, respectively, and

further specify the structure of the claimed thermocouple. New claims 87-90 depend from claims 42, 43 and 45, respectively, and add limitations similar to those outlined above.

Thus, in sum, it is submitted that the application is in a condition for allowance, and a formal notice thereof is respectfully solicited.

The Commissioner is hereby authorized to charge any additional fees required, including the fee for an extension of time, or to credit any overpayment to Deposit Account 20-0809. The applicant(s) hereby authorizes the Commissioner under 37 C.F.R. §1.136(a)(3) to treat any paper that is filed in this application which requires an extension of time as incorporating a request for such an extension.

Respectfully submitted,



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